

UNITED STATES ENVIRONMENTAL PROTECTION AGENCY

WSG 64

Date Signed: February 25, 1991

MEMORANDUM

SUBJECT: Interim Policy on the Inclusion of Pollution Prevention and Recycling Provisions in Enforcement Settlements

FROM: James M. Strock  
Assistant Administrator

TO: Regional Administrators  
Assistant Administrators  
General Counsel

This memorandum transmits the final interim policy on the use of pollution prevention and recycling conditions in Agency consent orders and decrees (see Attachment). It reflects your extensive comments on the draft version distributed on September 25, 1990, as well as the subsequent work of the Pollution Prevention/Settlement Policy Workgroup.

This interim policy is part of the Agency's overall strategy to make pollution prevention a major component of all Agency programs. It encourages the use of pollution prevention and recycling conditions in enforcement settlements, either as injunctive relief or as "supplemental environmental projects" incidental to the correction of the violation itself. When a pollution prevention condition is considered as a supplemental project, this interim policy should be used in conjunction with the recently issued Policy on the Use of Supplemental Enforcement Projects in EPA Settlements (February 12, 1991).

This interim policy is effective immediately and should be used whenever a pollution prevention condition is being considered as part of a consent order or decree. Each national media compliance program may decide whether to develop its own more specific pollution prevention settlement guidance or continue to use this general guidance. The Agency plans to develop final guidance in FY 1993, after gaining further experience in negotiating pollution prevention settlement conditions.

I am confident that this interim policy will help the Agency secure the additional protection of human health and the environment which pollution prevention offers. Any questions you or your staff may have regarding its implementation should be addressed to Peter Rosenberg, the workgroup Chairperson (Office of Enforcement, 382-7550).

Attachment

cc: Deputy Administrator  
Associate Deputy Administrator  
Deputy Regional Administrators  
Regional Counsels  
Regional Program Division Directors  
Program Compliance Directors  
Associate Enforcement Counsels  
OE Office Directors

## INTERIM EPA POLICY ON THE INCLUSION OF POLLUTION PREVENTION AND RECYCLING PROVISIONS IN ENFORCEMENT SETTLEMENTS

### I. Purpose

This document provides Agency enforcement personnel with a generic interim policy and guidelines for including pollution prevention and recycling provisions in administrative or judicial settlement agreements. It encourages pollution prevention and recycling both as a means of returning to compliance and as supplemental environmental projects by offering several incentives while preserving effective deterrence and accountability for compliance and environmental results.

### II. Background

The Agency defines pollution prevention as the use of procedures, practices, or processes that reduce or eliminate the generation of pollutants and wastes at the source. Pollution prevention encompasses both the concepts of volume reduction and toxicity reduction.<sup>1</sup> Within the manufacturing sector, examples of pollution prevention include such activities as input substitution or modification, product reformulation, process modification, improved housekeeping, and on-site closed-loop recycling. The Agency's "hierarchy" of environmental protection practices consists of pollution prevention, followed by traditional recycling, treatment and control, respectively.<sup>2</sup>

The Office of Enforcement's Prevention Action Plan (June 30, 1989), states that a strong enforcement program can promote pollution prevention goals by enhancing the desire of the regulated community to reduce its potential liabilities and resulting cost of resolving noncompliance. An emphasis on preventing pollution at the source can help reduce or eliminate root causes of some violations and thereby increase the prospects for continuous compliance in the future.<sup>3</sup>

In addition to this "indirect incentive for pursuing pollution prevention, the Action Plan recognized that pollution prevention could be directly achieved by initiating enforcement actions against

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<sup>1</sup> See the forthcoming Pollution Prevention Policy Guidance, especially pps. 3 - 6, for a full discussion of the considerations underlying the Agency's definition of pollution prevention. Both the Guidance and the Pollution Prevention Act of 1990 (P.L. 101 - 508) exclude "end of pipe" recycling from the formal definition of pollution prevention.

<sup>2</sup> Although non-closed loop (i.e., "end-of-pipe") recycling occupies the second tier of the "hierarchy" behind pollution prevention, it will, because of its environmental benefit, be included within the scope of this interim policy. All elements of this policy will apply to such recycling to the same extent as use and production substitution activities which constitute the formal definition of pollution prevention.

<sup>3</sup> Office of Enforcement Pollution Prevention Action Plan, page 2.

individual noncompliers. The Agency is constrained from requiring (i.e., imposing unilaterally) pollution prevention activities in the absence of statutory, regulatory, or permit language. Until the Agency commences an enforcement action, respondents are generally free to choose how they will comply with Federal environmental requirements. However, once a civil or administrative action has been initiated, the specific means of returning to compliance are subject to mutual agreement between the agency and the respondent.<sup>4</sup> The settlement process can be used to identify and implement pollution prevention activities consistent with the Agency's overall enforcement approach.

The Office of Enforcement chaired a workgroup, which included representation by the Program Compliance Offices and Regions III, IV, and VIII, to develop an interim policy on the use of pollution prevention conditions in enforcement settlements. In addition, OE and the Program will receive funding from the office of Pollution Prevention for technical support to develop and evaluate pollution prevention proposals in settlements in FY 1991-2 and to evaluate their utility for promoting long-term compliance and for permanently reducing the level of pollutants or toxic discharges into the environment.

### III. Statement of Interim Policy

It shall be a policy of the Environmental Protection Agency to favor pollution prevention and recycling as a means of achieving and maintaining statutory and regulatory compliance and of correcting outstanding violations when negotiating enforcement settlements. While the use of pollution prevention conditions is not mandatory (for either a program/Region to propose or for a defendant/respondent to accept), Agency negotiators are strongly encouraged to try to incorporate pollution preventions in single and multi-media settlements when feasible. The policy is applicable to both civil and criminal enforcement settlements involving private entities, Federal facilities or municipalities.

Among the types of situations which favor the use of pollution prevention conditions in enforcement settlements are:

- a. recurring patterns of violations which are unlikely to be corrected by additional "add on" controls or improved operations and maintenance, and elimination or substitution offers the best prospects for the permanent return to compliance;
- b. proposed solutions which do not create environmental problems in other media (i.e., have no negative cross-media impacts);
- c. effluent emissions or discharges for which technically and economically feasible pollution prevention options have been identified;

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<sup>4</sup> Note that some pollution prevention related activities, e.g., environmental auditing, can be sought as injunctive relief in appropriate circumstances. See, Final EPA Policy on the Inclusion of Environmental Auditing Provisions in Enforcement Settlements (GM-52)

- d. violations which involve one or more pollutants listed on the target list of 17 chemicals the Agency will emphasize as part of the implementation of its Pollution Prevention Strategy (see Appendix A for list of chemicals).

Pollution prevention settlement conditions can either be specific activities which correct the violation or activities which will be undertaken in addition to those necessary to correct the violation.

The interim policy should be implemented in concert with the Agency's new Pollution Prevention Guidance and Pollution Prevention Strategy, as well as office of Enforcement policy documents, including the EPA Policy on the Inclusion of Environmental Auditing Provisions in Enforcement Settlements (GM-52); A Framework for Statute-Specific Approaches to Penalty Assessments: Implementing EPA's Policy on Civil Penalties (GM-22); and the newly issued Supplemental Environmental Projects Policy (February 12, 1991), which amends the "alternative payments" section of GM-22; the Office of Enforcement's Pollution Prevention Action Plan (6/30/89); and the Manual of Monitoring and Enforcing Administrative and Judicial Orders (2/14/90).<sup>5</sup>

#### A. Pollution Prevention as a Means of Correcting the Violation

By definition, a use/source reduction or recycling activity which corrects the original violation will be media and facility specific. When conducting settlement negotiations, the Agency shall consider whether it is appropriate (e.g., technically and economically feasible) to correct the violations) through implementation of source reduction or recycling activities. Examples include compliance with permit requirements by switching from a high to a lower toxic solvent which reduces excessive emissions or discharges or by recycling effluent.<sup>6</sup>

Pollution prevention conditions may be proposed by either the Agency or the respondent. inclusion of any condition rests upon the outcome of mutual negotiations between the two sides.

#### B. Pollution Prevention Conditions "Incidental" to the Correction of the Violation

During negotiations to resolve the violation, the Agency also may consider as settlement conditions supplemental pollution prevention projects in addition to the specific actions or injunctive relief needed to correct the violation. Potential examples include phasing out a pollutant within a

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<sup>5</sup> These documents are available through the Office of Enforcement General Enforcement General Policy Compendium and/or the Enforcement Document Retrieval System (EDRS).

<sup>6</sup> A firm could theoretically return to compliance by reducing the scope of operations, i.e., by producing less and, therefore, reducing its discharge or emissions. Although this may return a facility to compliance, it is not "pollution prevention" within the Agency's definition nor the scope of this interim policy.

specific period of time or a commitment by a facility to change production technology at more than one facility.

Pollution prevention settlement conditions which do not by themselves correct the violation will usually be negotiated as "supplemental environmental projects" and, as such, are subject to the criteria described in the recently issued policy on the use of supplemental projects which amends part of the Agency wide Framework for Civil Penalties (GM-22)<sup>7</sup> The decision to consider, accept or reject such projects rests exclusively with the Agency.

#### IV. Specific Elements of the Interim Pollution Prevention Policy

##### A. Timelines for Implementing Pollution Prevention Conditions

EPA's enforcement policy calls for the "expeditious" return of the violator to compliance.<sup>8</sup> As a general rule, there shall be no significant ("significant" to be defined by each program) extension of the "normal", time period for returning to compliance. Under no circumstances will respondent be granted additional time to correct the violation in exchange for his conduct of a supplemental environmental project, (see IV B 2, below). For example, a facility which exceeds its effluent limit would have to return to compliance within the "normal" time period the NPDES program estimates for facilities of that size and type. This time period would be extended if, as part of the overall settlement, the respondent also agreed to establish a sludge recycling system.

If a pollution prevention activity is presented, as the means of correcting the violation, however, the Agency settlement team has some additional flexibility in negotiating an implementation schedule, given that pollution prevention alternatives sometimes add an element of complexity to a facility-specific compliance strategy, especially if it involves new or innovative technology.

The length of time which is deemed to be "expeditious" is ultimately a "best judgment" decision on the part of the EPA negotiators. It should be based upon their assessment of the ecological and public health related risks and benefits involved in providing the additional time to return to compliance.

While Federal negotiators should consider the following factors in deciding whether to use innovative pollution prevention technology as injunctive relief at any time, they become even more relevant when deciding whether to extend the "normal" timeline for resolving a violation. If a decision is

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<sup>7</sup> The term "supplemental environmental project" replaces the term alternative payments" used in GM-22. The Agency has recently issued a new policy on the use of these projects, Guidelines for Evaluating Supplemental Environmental Projects, which replaces the section on alternative payments on pps. 23 - 27 of GM-22. It provides detailed guidance on the "scope" of eligible supplemental projects, including ones which are related to pollution prevention. Also see Section IV B2 below.

<sup>8</sup> Civil Penalty Policy Framework (GM-22), page 13

made to extend the timeline, the Federal negotiators should also establish interim milestones and controls to assure the adequate protection of public health and the environment while the pollution prevention relief is being implemented. (cf. Section C, below):

### 1. Seriousness of the Violation

Both the aggregate amount and toxicity of excess emissions or discharges affect the decision whether to extend the compliance timeline. Some violations (e.g., those which meet "imminent and substantial" endangerment definitions) must be corrected as quickly as possible, even when that involves foregoing a pollution prevention approach in favor of traditional treatment technology. Even when the violation has a much less potentially adverse impact, Federal negotiators should consider whether the risk allows a longer timeframe.

### 2. Aggregate Gain in "Extra" Pollution Prevention

Schedules should be extended only where there is an important net permanent reduction in the overall amount or toxicity of the pollution as a result of a Pollution prevention project which requires a longer timeline to implement than would "end-of-pipe" controls. (Note: This consideration is appropriate only when a longer compliance timeline is at issue since, "all other things being equal," the Agency would prefer a pollution prevention approach to traditional treatment and/or disposal.)

### 3. Reliability/Availability of the Technology

The pollution prevention technology being used to implement the injunctive relief should (ideally) have been successfully applied or tested at other facilities. While not intended to discourage the use of innovative prevention or reduction technologies, the more "experimental" or "untried" the technology, the more rigorous Federal negotiators should be about extending the "normal" compliance timeline. The technology should also avoid the cross-transfer of pollutants.

### 4. Applicability of the Technology

The Federal negotiators should be more willing to extend the compliance timeline if the pollution prevention technology is applicable to other facilities, so that, if successful, the lessons learned can be disseminated industry wide.

### 5. Compliance-Related Conditions

The pollution prevention approach offers the best prospects for a permanent return to compliance.

## B. Penalty Assessments

### 1. General Considerations

Under EPA's general framework for assessing civil penalties (GM-22) and its program-specific applications, most formal enforcement actions are concluded with a penalty. The two elements of the penalty calculation are the gravity of the violation and the economic benefit of noncompliance. The former can be adjusted upward or downward depending several factors. The latter sets the penalty "floor."<sup>9</sup>

The willingness of a respondent to correct the violation via a pollution prevention project can be one of the assessment factors used to adjust the "gravity" component of the penalty.<sup>10</sup> The defendant/respondent's willingness to comply with permit requirements through pollution prevention activities can be seen as a "unique factor" (e.g., public policy considerations) which may warrant an adjustment of the gravity-based penalty factor consistent with program-specific penalty policies.

Calculation of the economic benefit of noncompliance may have particular consequences for the inclusion of pollution prevention conditions in settlements. For example, two of the variables used by the BEN Model to calculate the penalty are the time expected to elapse from the date of the violation until the date of compliance (i.e., the estimated future date at which the facility would be expected to return to full compliance) and the expected cost of returning to compliance.<sup>11</sup> This calculation could create a disincentive for a respondent to correct the violation with pollution prevention technology (i.e., the longer the facility is expected to be out of compliance and the higher the cost of returning to compliance, the larger the economic benefit of noncompliance and, ultimately, the larger the penalty.)

In order to eliminate this possible disincentive, the penalty amount should be calculated using the costs and timeframes associated with both the pollution prevention approach and the conventional way of correcting the violation. The final penalty will be the smaller of the two calculations, so long as the Federal negotiators have decided to allow the "longer" timeframe for returning to compliance. However, the settlement agreement should also provide for stipulated penalties in the event the violation is not corrected or exceeds its compliance schedule.

Several other criteria currently contained in GM-22 will continue to apply to pollution prevention projects. For example, a minimum cash penalty shall always be collected (subject to program-specific guidance), regardless of the value of the project, and it generally should not be less than the economic benefit of noncompliance.

## 2. Supplemental Environmental Projects

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<sup>9</sup> See OE's Guidance on Calculating the Economic Benefit of Noncompliance for a Civil Penalty Assessment, (GM-33)

<sup>10</sup> GM-22 pps. 3 - 4

<sup>11</sup> GM-22, pps. 6 - 10



When settling an enforcement action, the Agency also may seek additional relief in the form of activities which remediate the adverse health or environmental consequences of the original violation. The size of the final assessed penalty may reflect the commitment of the defendant/respondent to undertake these "supplemental environmental projects".

As noted previously, the Agency's recently issued Policy on the Use of Supplemental Environmental Projects, which amends and supersedes GM-22's discussion on "alternative payments," identifies pollution prevention projects as one of five general categories of projects eligible for consideration.<sup>12</sup> In order to be part of the consent order or decree, a proposed supplemental pollution prevention project must meet all of the criteria discussed in the policy, including those which relate to the "scope" of the projects, the amount of penalty reduction, and oversight requirements.

One important criterion involves the "nexus" between the violation and the supplemental project. Nexus," which is defined as "an appropriate ... relationship between the nature of the violation and the environmental benefits to be derived from the type of supplemental environmental project," helps assure that the supplemental project furthers the Agency's statutory mandate to clean up the environment and deter violations of the law.<sup>13</sup>

The policy also states that while studies are generally not eligible mitigation projects, this prohibition will be modified slightly only for pollution prevention studies.<sup>14</sup> The policy specifically exempt pollution prevention projects from the "sound business practices" limitation 'which are in effect for the four other categories of supplemental environmental projects.<sup>15</sup>

Federal negotiators who are considering the adoption of supplemental pollution prevention projects should refer specifically to the Policy on the Use of Supplemental Environmental Projects to make sure that the proposed pollution prevention project meets all applicable criteria.

### C. Tracking and Assessing Compliance with the Terms of the Settlement

The Agency places a premium on compliance with the terms of its settlements and several documents exist which outline procedures for enforcing final orders and decrees, which may range from

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<sup>12</sup> The five categories cover pollution prevention, pollution reduction, environmental restoration, environmental auditing, and public awareness.

<sup>13</sup> Policy, p. 1. The extended discussion of "nexus" and example of supplemental projects which meet the "nexus" requirement are on pps. 5 - 8.

<sup>14</sup> Policy, p. 9

<sup>15</sup> Policy, pps. 8 - 9

modification of the order to stipulated penalties and motions to enforce the order and contempt of Court.<sup>16</sup>

A more difficult situation arises when the respondent -- despite his best "good faith efforts" -- fails to successfully implement a pollution prevention activity which is required to correct the violation (e.g., is the injunctive relief). Ultimately, the respondent must be responsible for full compliance. If the pollution prevention approach does not work, he will be required to return to compliance through traditional means.

In order to make sure that the violation is corrected (as well as minimize any additional liabilities which may accrue to the defendant/respondent) the consent order or decree will state that any pollution prevention project which is used to achieve compliance with a legal standard must have a "fall-back" schedule requiring the use of a proven technology agreed to by all parties to the settlement and which will be implemented, if necessary, by a time certain. The settlement agreement also should establish a systematic series of short term milestones so that preliminary "warning signs" can be triggered promptly and issues raised. If the Agency decides that the "innovative" pollution prevention approach will not succeed, the "traditional" remedy must be implemented according to the set schedule. Under these circumstances, as long as the "fall-back" remedy is implemented on schedule, the defendant/respondent will only have to pay an additional penalty equal to the economic benefit of further delay in compliance offset by the actual expenditures incurred as a result of the unsuccessful effort to comply through pollution prevention. If the actual expenditures on pollution prevention equal or exceed the incremental economic benefit of noncompliance using conventional controls, there would be no additional penalty.

#### D. Delegations and Level of Concurrence

Settlement conditions which involve more than one program or Region (e.g., a multi-media or multi-facility case) usually require additional oversight, and the estimated amount of time and resources, required for effective oversight is one criteria which the Agency will use to determine whether to include the settlement agreement. The respondent should shoulder as much of the direct costs as feasible. (e.g., pay for an independent auditor to monitor the status of the project and submit periodic reports, including a final one which evaluates the success or failure of the project)

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<sup>16</sup> The respondents failure to carry out a pollution prevention activity which is a supplemental project shall be dealt with through procedures outlined in GM-22 and the Supplemental Environmental Protection Policy (e.g., reimposition of the full civil penalty and/or the assessment of stipulated penalties contained in the settlement once the Government determines that the conditions have not been fulfilled).

Each Region should develop its own coordination procedures for negotiating and overseeing a multi-media pollution prevention condition which affect only that Region (i.e., applies only to the specific facility or other facilities within the Region).

The extent of coordination/concurrence required for a pollution prevention settlement which involves more than one Region will vary according to the nature and complexity of the proposal. The negotiation team should at a minimum notify and coordinate with other affected Regions about pollution prevention conditions which would have an impact on facilities in those Regions (e.g., an agreement for the respondent to conduct environmental audits; or an agreement for solvent substitution at other facilities not in violation).

However, the negotiation team would have to receive the concurrence of all affected Regions if the proposed pollution prevention condition involved significant oversight resources or activities (e.g., if it required major construction or process changes). For this type of situation, the settlement team must notify all affected Regions that it is considering the inclusion of such conditions as part of a proposed settlement prior to the completion of the negotiations. These Regions will then have the opportunity to comment on the substance and recommend changes to the scope of the proposal. Each entity will have to concur with the pollution prevention condition and agree to provide the necessary oversight in order for it to be included in the settlement agreement. The Programs and Regions must also agree on their respective tracking and oversight responsibilities before lodging the consent order or decree.

The Headquarters compliance programs and the Office of Enforcement will be available to help Regions coordinate this concurrence process and to help the parties reach a consensus on oversight roles and responsibilities, where necessary. Concurrence by the Headquarters program office and the Office of Enforcement will be mandatory only where it is already required by existing delegations or for supplemental projects as described in the Supplemental Environmental Projects policy.

## V. Organizational Issues

### A. Copies of Settlements

The Regions should send copies of settlements with pollution prevention conditions to the respective national compliance officer (consent order) or Associate Enforcement Counsel (consent decree) for insertion to the Enforcement Docket Retrieval System (EDRS). In addition, the Region should enter a brief descriptive summary of the settlement (1 - 2 pages) into the Pollution Prevention Information Clearinghouse (PPIC, 1-800-424-9346) enforcement settlement file which is being established. This will enable all the Programs and Regions to have "real time" information about pollution prevention settlements which have been executed, and will enable the Office of Enforcement

and the programs to conduct an overall assessment of the impact of pollution prevention conditions in Agency settlements as part of the process of developing a final settlement policy in FY 1993.

#### B. Media-Specific Policies

The media programs and Regions have begun to implement their own pollution prevention strategies. Since they are still gaining experience in identifying and applying source reduction technologies to enforcement situations, and developing the technology and resources to track and evaluate these conditions, this interim policy adopts a phased approach that encourages, but does not require, them to try to incorporate pollution prevention conditions on a case-by-case basis where they enhance the prospects for long-term compliance and pollution reduction.

Each national program manager may decide whether to develop its own specific pollution prevention guidance (consistent with this interim guidance) or continue to use the general interim guidance. Program-specific guidance should discuss when to include pollution prevention conditions in settlements, and describe the categories of violations for which pollution prevention "fixes" are most encouraged and the specific types of source reduction or recycling activities considered appropriate for that program. The National Program Manager may also adopt additional reporting or concurrence requirements beyond those described in this interim policy. The Programs can develop specific policies on their own schedule, utilizing this general interim policy until they do so.

## APPENDIX A

**INDUSTRIAL TOXICS PROJECT**  
**17 TARGET CHEMICALS**  
 1988 TRI Reporting Year  
 (in Pounds)

Chemical Name	U.S. Production 1988 (in 000 lbs)	Imports 1988 (in 000 lbs)	Number of Facilities	Release to Air	Release to Water	Deep-Well Injection	Release to Land	Transfer to POTW	Other Transfer	Annual Total Release + Transfer
BENZENE	11,630,000 <sup>a</sup>	956,800 <sup>b</sup>	453	28,117,955	46,589	636,314	221,192	1,102,265	2,272,877	33,097,192
CADMIUM & COMPOUNDS	4,189 <sup>c,1,2</sup>	5,512 <sup>c,1,2</sup>	166	119,412	4,382	2,409	541,530	20,115	1,360,967	2,048,815
CARBON TETRACHLORIDE	747,000 <sup>b</sup>	111,000 <sup>d</sup>	84	3,683,121	15,667	98,054	14,759	5,014	1,186,781	5,003,396
CHLOROFORM	529,600 <sup>a</sup>	27,000 <sup>b</sup>	166	22,974,156	1,089,285	36,002	68,483	1,226,573	1,467,914	26,862,413
CHROMIUM & COMPOUNDS	291,000 <sup>c,1,2</sup>	912,700 <sup>c,1,2</sup>	1,882	1,181,482	389,475	101,180	28,125,080	2,107,561	24,960,834	56,865,612
CYANIDE & COMPOUNDS	417,600 <sup>a,3</sup>	26,800 <sup>a,4</sup>	355	1,961,210	193,456	7,460,999	106,299	1,147,962	2,915,637	13,805,563
DICHLOROMETHANE	504,100 <sup>b</sup>	25,000 <sup>b</sup>	1,525	126,796,287	347,336	664,750	156,647	2,584,199	22,885,336	153,434,555
LEAD & COMPOUNDS	2,216,000 <sup>c,1,2</sup>	374,800 <sup>c,1,2</sup>	1,277	2,587,790	237,014	2,755	27,494,165	207,732	28,177,731	58,707,187
MERCURY & COMPOUNDS	1,026 <sup>c,1,2,5</sup>	760 <sup>c,1,2</sup>	43	25,629	1,406	27	13,779	2,136	275,224	318,201
METHYL ETHYL KETONE	482,000 <sup>b</sup>	20,000 <sup>b</sup>	2,284	127,675,717	76,593	213,962	155,049	932,567	30,002,775	159,056,683
METHYL ISOBUTYL KETONE	205,300 <sup>b</sup>	20,000 <sup>b</sup>	933	30,523,897	762,108	121,650	31,912	1,508,530	10,760,598	43,708,695
NICKEL & COMPOUNDS	100,000 <sup>a,2</sup>	320,000 <sup>c,1,2</sup>	1,253	539,864	209,887	152,925	3,644,070	881,506	14,000,659	19,428,911
TETRACHLOROETHYLENE	497,700 <sup>a</sup>	119,000 <sup>b</sup>	680	32,277,372	33,284	72,250	105,644	586,138	4,428,398	37,503,086
TOLUENE	6,300,000 <sup>b</sup>	886,800 <sup>b</sup>	3,606	273,752,712	254,175	1,431,916	882,691	3,544,407	64,762,046	344,627,947
1,1,1-TRICHLOROETHANE	723,700 <sup>a</sup>	22,000 <sup>b</sup>	3,518	170,420,900	94,310	1,000	187,396	293,219	19,480,645	190,477,470
TRICHLOROETHYLENE	200,000 <sup>a</sup>	13,000 <sup>b</sup>	868	49,071,464	13,550	390	20,940	78,758	6,231,064	55,416,166
XYLENES	6,575,200 <sup>a,6</sup>	225,000 <sup>a,7</sup>	3,187	155,888,584	299,375	122,977	834,174	4,213,788	40,215,084	201,573,979

- a. Synthetic Organic Chemicals, USITC, 1989, Publication #2219.  
 b. Mannville Chemical Product Synopsis, Mannville Chemical Products Corp.  
 c. Mineral Commodity Summaries, U.S. Bureau of Mines, February 1989  
 d. Chemical Economics Handbook, SRI International  
 1. Production from primary and secondary refining, no mining data  
 Production and import data does not include metal compounds  
 2. Metals content, except for gross weight of Chromium  
 3. Hydrogen Cyanide only  
 4. Sodium Cyanide only, 1987 data  
 5. Includes secondary Mercury released from Dept. of Energy stocks  
 6. Only ortho and para Xylene reported  
 7. Only para Xylene reported

